Remarks:

Prior to entry of the present amendment, claims 1-25 remained pending in the application. Claims 1-4, 6-7, 9-12 and 14-25 stand rejected under 35 U.S.C. §102(b) based on Yagi et al. (US 5,896,032). Claim 8 stands rejected under 35 U.S.C. §102(b) based on Andermo et al. (US Re. 34,741). Claims 5 and 13 stand rejected under 35 U.S.C. §103(a) based on Yagi et al. in view of Andermo.

By this amendment, applicants have amended claims 1, 5, 9, 13, 14, 16, 18, 19 and 25. Claims 4 and 12 have been cancelled, without prejudice. Claims 2, 3, 6-8, 10, 11, 15, 17 and 20-24 remain unchanged. New claims 26 and 27 have been added. In view of the foregoing amendments and the following remarks, applicant requests reconsideration of the rejected claims under 37 C.F.R. § 1.111.

Objection to the Title

The Examiner objects to the title as not being descriptive of the invention to which the claims are directed. Nevertheless, applicants have amended the title to read "SENSOR WITH VARYING CAPACITANCE BASED ON RELATIVE POSITION BETWEEN OBJECTS." If the Examiner feels that this title is not descriptive, applicants respectfully request that the Examiner suggest an alternative title.

Objections to the Claims

The Examiner also objects to claims 18 and 19, indicating that the phrase "objects translate relative to one through the operative range" should read objects translate relative to one **another** through the operative range." Appropriate correction has been made.

Rejections Under 35 U.S.C. §102(b)

As noted above, claims 1-4, 6-7, 9-12 and 14-25 stand rejected under 35 U.S.C. §102(b) based on Yagi et al. (US 5,896,032). Yagi et al. discloses a position detection device that detects relative displacement between two members. The position detection device includes "a pair of first electrodes at equal pitches on one side of the two members that have relative displacement in at least one dimension, and a linear array of at least one second electrode on the other member" (see Abstract).

The set of first electrodes are moved relative to the set of second electrodes, thereby selectively establishing an area of overlap between a selected one of the first electrodes and a corresponding one of the second electrodes. Current flowing through the respective electrodes in indicative of overlap, and thus is indicative of relative positions of the selected first electrode and the second electrode (when compared with corresponding adjacent electrode relationships). Yagi et al. discusses relative movement of the electrodes only in the x-y plane (in the +x-direction or the –x-direction). No movement in the z-direction is discussed.

As best indicated in Fig. 2, the first electrodes are spaced such that only one of the first electrodes overlays the second electrode at any given time. Comparative information is available by reviewing current resulting from overlap of another first electrode with another second electrode. Positional information thus may be distorted by variations in relative z-direction positions of the first electrodes.

As amended, claim 1 recites a movable system having capacitance-based position sensing, the system including "a capacitance-based position sensor having a first plate secured to one of the objects and a pair of second plates secured to the

other of the objects so that the second plates are adjacent and coplanar, and so that the second plates are spaced from, and parallel to, the first plate as the objects move relative to one another along the axis, where the configuration of the first plate and second plates results in two spaced-plate capacitors having capacitances that vary as the objects move relative to one another within the operative range along the axis, where the capacitance-based position sensor uses the capacitances to generate output usable to determine relative position of the objects along the axis, and where the capacitance-based position sensor is configured so that the output is substantially independent of perpendicular spacing variations occurring between the first plate and each of the second plates." As noted above, Yagi et al. fails to disclose or suggest a "capacitance-based position sensor is configured so that the output is substantially independent of perpendicular spacing variations occurring between the first plate and each of the second plates." In fact, the Examiner expressly recognizes that "Yagi et al. fails to disclose the capacitors of the capacitance measuring circuit having an output-input transfer function that is substantially independent of perpendicular spacing variations occurring between the first plate and the second plates" in paragraph 5 of the October 20, 2004 Office action.

Although the Examiner references column 8, lines 63-65 as disclosing a capacitance-based position sensor "configured so that the output is substantially independent of spacing variations occurring between the first plate and each of the second plates" (emphasis added), careful reading reveals that the cited language actually indicates that detection of "displacement is not affected by changes in the spacing between the array of first electrodes and the array of second electrodes"

(emphasis added). In fact, spacing variations between the first plate and each of the second plates in Yagi et al. will affect the current, and thus will affect detection of displacement. The cited language refers only to uniform changes in spacing between the first array (e.g., all of the first electrodes) and the second array (e.g. all of the second electrodes), not variations from the first plate to each of second plates (e.g. where the spacing between the first plate and the second plate A is different than the spacing between the first plate and second plate B). Such variations are not even considered by Yagi et al. The rejection of claim 1 under 35 U.S.C. §102(b) based on Yagi et al. thus should be withdrawn.

Claims 2, 3, 6 and 7 depend from claim 1, and thus are allowable for at least the same reasons as claim 1.

Claim 9 recites a sensor that outputs varying capacitance based upon changes in relative position along an axis between a pair of objects, the sensor including a first plate secured to one of the objects and a pair of second plates secured to the other of the objects so that the second plates are adjacent and coplanar, and so that the second plates are spaced from and parallel to the first plate as the objects move relative to one another along the axis, where the configuration of the first plate and second plates results in two spaced-plate capacitors having capacitances that vary as the objects move relative to one another along the axis, where the sensor uses the capacitances to generate output usable to determine relative position of the objects along the axis, and where the sensor is configured so that the output is substantially independent of perpendicular spacing variations occurring between the first plate and each of the second plates. As generally noted with respect to claim 1, Yagi et al. fails to disclose or suggest a sensor configured so

that the output is substantially independent of perpendicular spacing variations occurring between the first plate and each of the second plates. The rejection of claim 9 under 35 U.S.C. §102(b) based on Yagi et al. thus should be withdrawn.

Claims 10 and 11 depend from claim 9, and thus are allowable for at least the same reasons as claim 9.

Claim 14 recites a sensor that outputs varying capacitance based upon changes in relative position between a pair of objects, the sensor including a first plate assembly configured to be fixed to one of the objects and including plural first plates, and second and third plate assemblies configured to be fixed to the other of the objects, the second plate assembly including plural second plates, the third plate assembly including plural third plates, where the plate assemblies are configured so that total overlap between the first plates and the second plates, and the total overlap between the first plates and the third plates, repeatedly increases and decreases as the objects translate relative to one another through an operative range of motion along an axis, such that a first plate of the first plate assembly simultaneously forms, with each of second and third plates of each of the second and third plate assemblies, variable capacitors having capacitance that varies with relative positions of the objects. As noted generally above, Yagi et al. fails to disclose or suggest simultaneous overlap of a first plate with each of second and third plates. The rejection of claim 14 under 35 U.S.C. §102(b) based on Yagi et al. thus should be withdrawn.

Claims 15-24 depend from claim 14 and thus are allowable for at least the same reasons as claim 14.

Claim 25, like claim 14, recites "that a first plate of the first plate assembly simultaneously forms, with each of second and third plates." Yagi et al. fails to disclose or suggest simultaneous overlap of a first plate with each of second and third plates. The rejection of claim 25 under 35 U.S.C. §102(b) based on Yagi et al. thus should be withdrawn.

Claim 8 stands rejected under 35 U.S.C. §102(b) based on Andermo (US Re. 34,741). Andermo discloses a capacitance-type measuring apparatus with first and second support members. A first electrode array and a second electrode are coupled to the first support member. A third electrode array is coupled to the second support member. The first electrode array and second electrode are capacitively coupled via the third electrode array.

Although the geometry of the end portions of the transmitter electrode array 310 (or the detector electrode 320) is modified, such modification is made to address tilt, not to produce "an output-input transfer function that is substantially independent of spacing variations occurring between the first plate and each of the second plates" (claim 8). As noted in column 7, lines 39-45 (cited by the Examiner), "the degree of coupling between the first transmitter electrode array and the detector electrode...linearly decreases relative to the measurement axis along the extent of each end portion...[such that] the error caused by tilt can be very considerably improved." Andermo thus proposes to address the problem of tilt by decreasing the length of the electrodes so as to decrease the variance of spacing of an individual electrode. There is no discussion whatsoever of "an input-output transfer function that is substantially independent of spacing variations between the first plate and each of the second plates" (e.g. where the spacing between the first plate and

second plate A is different than the spacing between the first plate and second plate B) as recited in claim 8. Such variations are not even considered by Andermo. The rejection of claim 8 under 35 U.S.C. §102(b) based on Andermo thus should be withdrawn.

Rejections Under 35 U.S.C. §103(a)

Claims 5 and 13 stand rejected under 35 U.S.C. 103(a) based on Yagi et al. in view of Andermo, both of which are discussed in detail above.

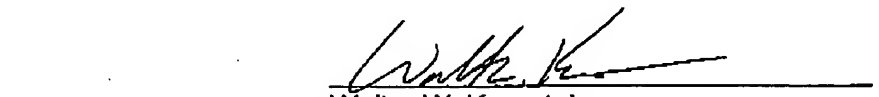
As noted by the Examiner, "Yagi et al. fails to disclose the capacitors of the capacitance measuring circuit having an output-input transfer function that is substantially independent of perpendicular spacing variations occurring between the first plate and the second plates as a result of the pair of objects moving relative to one another." The Examiner thus refers to Andermo, indicating that Andermo discloses "a modification of geometry of the first plate, thereby inherently modifying the transfer function, to significantly reduce the effects of perpendicular spacing variations, or tilt, occurring as a result of the pairs of objects moving relative to one another." Applicant notes, however, that claims 5 and 13 recite "an input-output transfer function that is substantially independent of spacing variations between the first plate and each of the second plates as a result of objects moving relative to one another" (e.g. where the spacing between the first plate and second plate A is different than the spacing between the first plate and second plate B) as recited in claims 5 and 13. Such variations are not even considered by Andermo. The rejection of claims 5 and 13 under 35 U.S.C. §103(a) based on Yagi et al. in view of Andermo thus should be withdrawn.

Conclusion

Applicants believe that this application is now in condition for allowance, in view of the above amendments and remarks. Accordingly, applicants respectfully request that the Examiner issue a Notice of Allowability covering the pending claims. If the Examiner has any questions, or if a telephone interview would in any way advance prosecution of the application, please contact the undersigned attorney of record.

Respectfully submitted,

KOLISCH HARTWELL, P.C.



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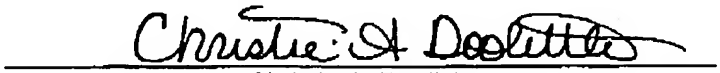
I hereby certify that this correspondence is being facsimile transmitted to Examiner B. Drula, Group Art Unit 2652, Assistant Commissioner for Patents, at facsimile number (703) 872-9306 on February 18, 2005.



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